REMARKS

The Office Action indicates that a certified copy of the Japanese application has not been filed with regard to Applicant's claim for foreign priority. The foreign priority documents were transmitted on January 10, 2001, after the previous Office Action. Please acknowledge receipt of the priority documents.

The enclosed Information Disclosure Statement includes references cited in related Patent Application U.S. Serial No. 09/533 561. English abstracts of applied prior documents JP 9-144834 and JP 11-197843 are provided for the Examiner's convenience. A complete copy of the '561 application is also provided for the Examiner's consideration.

The amendments to Claims 1, 2, 4 and 6-12 are intended to correct minor informalities therein, such as the lack of antecedent basis for the extension portion recited in Claim 2. Other amendments, such as changing "pressure" to ---force--- at original Claim 1, line 1 and changing "baffling" to ---stabilizing--- at original Claim 1, line 7, and throughout the claims, better describe the invention. The amendments are not believed to change the scope of the claims.

Turning now to the claim rejections, Claims 1-12 are rejected under 35 USC § 102(b) as being anticipated by Obara (JP 07-290251). However, the arrangement of main Claim 1 is believed distinguishable from Obara for the following reasons.

Obara discloses a C-shaped welding gun provided with a pressure application shaft or movable arm 8 that is driven by a rotary shaft 5 of a motor 1 having a nut 7 integrally secured thereto. A screw 9 is integrally provided with the pressure application shaft 8 and is engaged with the nut 7. A turning stop mechanism 11 is provided on the pressure application shaft 8 so that rotation of the rotary shaft 5 and the ball nut 7 causes reciprocating motion of the pressure application shaft 8 including the screw shaft 9 integrally provided therewith. Thus, only the ball nut 7 rotates with the hollow rotary shaft 5. Element 10 is a welding electrode secured to an end of the pressure application shaft or moving arm 8.

In Applicant's Figure 1, the rotary shaft is coaxially fixed to the screw shaft 7. A nut 13 is fixed to a force application shaft 9. Rotation of the rotary shaft 5 and screw shaft 7 causes linear movement of the force application shaft 9.

The rejection interprets the elements of Obara as follows. The rejection states that a pressure application shaft 10 of Obara is driven by a motor 1 including a screw shaft 10 provided integrally with or substantially integrally with a rotary shaft 9 of the motor. Thus, in the rejection the element 10 is both a pressure application shaft and a screw shaft. However, Figure 1 of Obara clearly shows that the element 10 is an electrode.

Further, the rejection states that the screw shaft 10 is provided integrally with or substantially integrally with a rotary shaft 9 of the motor. The screw shaft 9 in Figure 1 of Obara is integral with the moving arm 8 and electrode 10, which is defined as the pressure application shaft. The screw shaft moves only axially to open or close the gap between electrodes 10 and 13. The actual rotary shaft 5 in Obara rotates to drive the screw shaft. Thus, the rotary shaft and screw shaft of Obara can not be integral or substantially integral with each other because the shafts do not move together in the same direction or rotation.

The rejection further states that nut 11 is provided integrally with or substantially integrally with the pressure application shaft and is screwed with a screw of the screw shaft. Figure 1 of Obara shows that the turning stop mechanism 11 provided on the pressure application shaft 8 prevents the rotary force on the rotary shaft 5 from rotating the pressure application shaft or moving arm 8. Thus the turning stop mechanism 11 prevents rotation and is not screwed by the screw threads of the screw shaft 9 positioned within the aperture of the hollow rotary shaft 5.

The rejection still further states that a rotary force outputted from the rotary shaft is converted into a reciprocating motion of the pressure application shaft. As discussed above, the rotary shaft 9, as defined in the rejection, is fixed to the pressure application shaft 10 and thus can not convert rotary force into a reciprocating motion of the pressure application shaft.

In conclusion, Obara does not disclose or teach a screw shaft fixed to a rotary shaft of the motor as recited in lines 3 and 4 of Applicant's Claim 1. Further the nut 11 of Obara is not fixed to the force application shaft and screwed by a screw of the screw shaft. As discussed above, the nut 11 of Obara constitutes a turning stop mechanism 11.

For the above reasons, independent Claim 1 and Claims 2-12 dependent therefrom are believed patentable over Obara.

Further, dependent Claims 2-12 include other features not present in Obara. For example, Applicant's Claim 2 recites that the screw shaft is integrally provided on the rotary shaft of the motor by extending the rotary shaft of the motor in the output direction of the motor to form the screw shaft on an extension portion. As shown in Applicant's Figures 1 and 2, rotary shaft 5 includes the screw shaft 7 integrally provided on an extension portion of the shaft 5. The rejection states that Obara discloses the screw shaft 10 integrally provided on the rotary shaft 9 of the motor by extending the rotary shaft of the motor in the output direction to form the screw shaft on the extension portion. As discussed above, shaft 9 of Obara is a screw shaft that moves axially and does not rotate. Thus the screw shaft 9 is not integral with the rotary shaft 5 and ball nut 7 of Obara. Moreover, the screw shaft 9 of Obara also cannot be described as a rotary shaft for the reasons stated above.

With respect to dependent Claims 3-5, the screw shaft of Obara is not fixed to the rotary shaft of the motor for the reasons set forth above.

Claim 3 further recites boring a hole at the output side of the rotary shaft of the motor and inserting one end of the screw shaft into the hole in order to make the elements substantially integral. This arrangement is shown in Applicant's Figure 3. Obara does not disclose a hole at the output side of the rotary shaft and inserting an end of the screw shaft into the hole such that the shafts are integral.

Claim 4 further recites rendering the rotary shaft of the motor hollow to form a hollow portion and having the screw shaft penetrate

the hollow portion to fix the screw shaft to the hollow portion. This arrangement is shown in Applicant's Figures 4 and 5. While Obara shows a screw shaft 9 within a hollow rotary shaft 5, the two shafts do not rotate together, as the screw shaft 9 merely moves in the axial direction as discussed above.

Claim 5 further recites fixing the screw shaft to the rotary shaft of the motor utilizing a friction force. This arrangement is shown, for example, in Applicant's Figure 4. There is no disclosure in Obara of fixing the screw shaft to the rotary shaft, much less fixing the shafts by utilizing a friction force.

Claim 6 recites the nut integrally provided on the force application shaft by rendering the force application shaft hollow and forming a screw on the inner periphery of the force application shaft at the end thereof. The rejection relies on the nut 11 of Obara integrally provided on the pressure application shaft 7 to define this feature. Thus, with regard to Claim 6, the pressure application shaft of Obara is listed as element 7. However, the rejection of Claim 1 states that the pressure application shaft is element 10 of Obara. Further, the ball nut 7 of Obara rotates along with the rotary shaft 5 and thus cannot be part of a pressure application shaft, as the ball nut 7 does not move axially.

Claims 7 and 8 also recite that the nut is substantially integrally provided on the pressure application shaft. Thus these claims are believed allowable for the reasons set forth above in the discussion of dependent Claim 6. Further, dependent Claims 7 and 8 recite fixing a nut to the force application shaft at the end thereof. This feature is not believed present in the applied prior art.

Dependent Claim 9 recites an elastic body disposed on the axis of the force application shaft through which the force exerts, and an electromagnetic brake disposed on the rotary shaft of the motor. The rejection states that Obara discloses an elastic body A disposed on the axis of the pressure application shaft. Element A in Obara is not an elastic element, but probably is a metal element securing elements of the C-shaped welding gun. Further, there is no

electromagnetic brake disposed on the apparatus of Obara, much less on the rotary shaft of the motor.

Claims 10 and 11 recite the driving unit of a welding equipment further comprising a machining part provided on the end of the rotary shaft opposite the output side thereof and the end of the screw shaft opposite to the output side of the rotor shaft, respectively, on which a manual operating handle is mounted. The rejection states that a machining part B is provided on the end of the rotary shaft or screw shaft opposite to the output side thereof, on which a manually operating handle is mounted. Applicant's Claims 10 and 11 are drawn to the embodiment of Figures 1-3 showing a machining part 51 mounted on the end of the rotary shaft enabling a manual operating handle to rotate the shaft. Applicant's Figure 4 shows the end of the screw shaft including a machining part 51 enabling rotation thereof by a manual operating handle. The end B labeled in Figure 1 of Obara merely defines a casing for containing the screw shaft 9 therein. There is no machining part provided on the end of the screw shaft 9 of Obara.

Applicant's Claim 12 recites a driven part provided on the rotary shaft of the motor or the screw shaft and positioned between the rear body of the motor and the front of a position detector for transmitting the torque of the motor and a manual operating driving part that is positioned eccentrically from the screw shaft for transmitting a turning torque to the driven part. Applicant's Figures 5-7 show a position detector 14 and a manually operating driving part positioned eccentrically from the screw shaft as recited in Claim 12. The rejection states that Obara discloses a driven part C that is provided on the rotary shaft of the motor of the screw shaft and positioned between the rear of a body of the motor and the front of a position detector. This statement is not understood. Element C of Obara is moved manually by elements 12 and 14. Further, element C of Obara is not positioned between the rear of a body of the motor and the front of a position detector for transmitting the torque of the motor. In fact, element C is not associated with the motor, as best understood, much less the motor driving the opposing electrode. Further, no element in Figure 1 of

Obara appears to correspond to a position detector. It is unclear what element in Obara comprises a driven part provided on the rotary shaft, much less a driving part positioned eccentrically from the screw shaft for transmitting a turning torque to the driven part.

For the above reasons, dependent Claims 2-12 are believed allowable over the applied prior art.

Claims 13-15 are rejected under 35 USC § 103 as being unpatentable over Obara (discussed above) in view of Honda (JP 09-144834). The Honda patent document discloses a position adjusting actuator including a screw shaft 8, a movable rod 4, a driving source 12, drive gears 13a, 13b and a manual gear 19 connected to a tool A for manual driving of the gears.

Claims 13-15 are allowable for the reasons discussed above with respect to independent Claim 1 and dependent Claim 12. Further, dependent Claims 13-15 contain other features which are believed to patentably distinguish over the applied prior art. For example, Claim 13 recites that the driven part is formed of a gear, and further recites a machining part that is manually operable and is formed in a gear of the driving part connected to the gear of the driven part directly or by way of a serrated tooth belt. Honda discloses a manual tool A and manual gears 19 connected to the drive gears 13a, 13b. Obara discloses a screw element 9 movable in an axial direction in response to rotation of the rotary shaft 5 and ball nut 7. However, the screw shaft 8 of Honda rotates without moving axially to cause axial movement of rod 4. No rotary shaft is shown in the Honda reference axially aligned with the screw shaft 8. Rather, the rotating shaft of Honda is within the driving source element 12. Thus, the physical arrangement of Honda is different from that set forth in Applicant's claims as the rotary shaft of the motor is not positioned substantially coaxially with the screw shaft as recited in Applicant's Claim 1. Because the Honda document shows the driving source offset from the screw shaft, there is no motivation, absent Applicant's disclosure, to pick and choose parts from the arrangement of Honda to combine with the arrangement of Obara to obtain Applicant's claimed invention. Further, dependent Claims 14 and 15 recite in more detail the driving arrangement set

forth in Applicant's Figures 5-7. Finally, neither Obara or Honda disclose a position detector as recited in parent Claim 12.

For the above reasons, Claims 13-15 are believed allowable over the applied prior art.

New Claims 16-20 are also believed allowable over the applied prior art. Claim 16 recites a driving unit including a screw shaft having a threaded screw portion and fixed to and coaxially aligned with the rotary shaft of the motor. As discussed earlier, the JP '251 (Obara) patent discloses a screw shaft 9 axially movable in response to rotation of the rotary shaft 5. Thus, independent Claim 16, and Claims 17-19 dependent therefrom, are believed patentably distinguishable from the applied prior art.

Independent Claim 20 claims the Figure 2 embodiment of the invention including a spring, and is believed allowable.

Favorable reconsideration of this application and allowance of Claims 1-21 is respectfully requested.

Respectfully submitted,

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Marked Up Claims 1, 2, 4 and 6-12
Clean Replacement Specification Pages 5, 5a, 12, 12a and 14, 14a
Clean Replacement Claims 1, 2, 4, 6-12 and New Claims 16-20
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winding 3 of the stator of the servomotor 1, in a state shown in Fig. 1, the rotor magnetic pole 4 is excited so that the rotary shaft 5 and screw shaft 7 are turned. As the screw shaft 7 is turned, the nut 13 meshing with the male screw 8 of the screw shaft 7 is advanced, so that the pressure application shaft 9 integrated with the nut 13 is also advanced. As a result, the movable arm, swingable arm, or work placing table, or the like performs pressure application operation by way of the trunnion shaft 10.

As mentioned in detail above, since the screw shaft 7 is integrated or substantially integrated with the rotary shaft 5 and the same bearing can be shared by the screw shaft 7 and the rotary shaft 5, the driving unit of a welding equipment can be reduced in length compared with the conventional driving unit of a welding equipment so that the length of the welding equipment is reduced to become compact. Further, since the moment of inertia applied to the servomotor 1 is reduced, moving response of the pressure application shaft 9 and the welding electrodes caused by the servomotor 1 is remarkably enhanced, realizing ~~a~~man efficient welding equipment that has an excellent operability.

As a baffling or stabilizing mechanism of the pressure application shaft 9, there is employed a known baffling mechanism such as a ball spline mechanism provided between the pressure application shaft 9 and the frame case 11, a mechanism using the bearing 12 and its rail.

Further, as shown in Fig. 1, if the machining part 51 on which the manually operating handle is mounted is formed on the end of the rotary shaft 5 opposite to the output side of the rotary shaft 5, the manually operating handle is mounted on the machining part 51 to turn the rotary shaft 5 manually to guide the pressure application

shaft 9 to a desired position when the servomotor 1 is troubled.

Although in the first embodiment set forth above, a servomotor is employed as a motor, it is needless to say that a well-known motor such as a stepping motor,

between the front of the position detector 14 and the rear of the body of the servomotor ~~image pickup means~~1 and the gear ~~33~~63 for applying a turning torque to the gear 61 is positioned eccentrically from the rotary central axis of the servomotor 1. As a result, the gear 62 for applying a turning torque to the gear 61 is easily provided to render the driving unit of a welding equipment compact as a whole.

Although the gear 61 of the driven part is formed on the ball screw shaft 7 for transmitting the torque of the servomotor 1, the gear 61 of the driven part for driving the torque may be provided instead of the ball screw shaft 7 in the case that the rotary shaft 5 is extended rearward the body of the servomotor 1 as illustrated in the first to third embodiments.

Sixth Embodiment (Fig. 6):

A driving unit of a welding equipment according to a sixth embodiment is described next.

A gear 62 of a driving part for driving a gear 61 forming a driven part for transmitting the torque of a servomotor 1 is made standby when the servomotor 1 operates. That is, a returning spring 72 formed of an elastic body is biased in guide shaft 71 for holding the gear 62 to form a standby unit. The guide shaft 71 is a h0latch input terminal LE formed in a housing 73 of a position detector 14 and it is jounaled by a bearing 76 of a bearing holding member 75 screwed in the entrance of the hole 74. Depicted by 77 is a manually operating knob and 78 is a dust seal.

In the sixth embodiment, the gear 62 is normally forced to standby upward by the returning spring 72 serving as a standby unit, and hence it does not mesh with the gear 61 so that the gear 62 is not turned when the motor operates.

When a pressure application shaft 9 can not perform the reciprocating motion, the manually operating knob 77

is first pressed against the urging force of the returning spring 72 so that the gear 62 meshes with the gear 61. At this time, when the manually operating knob 77 is turned to turn the gear 62, a ball screw

Also in the seventh embodiment, since the gear 61 merely runs idle when the motor normally operates, wasting energy consumption is reduced.

Since the driving unit of a welding equipment comprises a screw shaft provided integrally with or substantially with a rotary shaft of the motor, a nut provided integrally with or substantially integrally with the pressure application shaft and is screwed with a screw of the screw shaft, and a baffling mechanism provided on the pressure application shaft, wherein the rotary shaft of the motor is positioned substantially coaxially with the screw shaft and a rotary force outputted from the rotary shaft of the motor is converted into a reciprocating motion of the pressure application shaft, it is possible to provide the driving unit of a welding equipment capable of reducing the size of the driving unit, of reducing the moment of inertia, and of being compact and having an excellent operability.

Further, since the screw shaft is substantially integrally provided on the rotary shaft of the motor by fixing the former to the latter utilizing a friction force, it is possible to provide the driving unit of a welding equipment capable of fixing both the screw shaft and the rotary shaft to each other without requiring a troublesome operation such as shrinkage fit or cold shrinkage fit.

Still further, since the elastic body is disposed on the axis of the pressure application shaft through which the pressure application force exerts, and the electromagnetic brake is disposed on the rotary shaft of the motor, it is possible to provide the driving unit of a welding equipment capable of securing the application of pressure to a workpiece by a pressure application shaft.

~~or~~On a screw shaft opposite to the output side of the rotary shaft, on which a manually operating handle is mounted, it is possible to provide the driving unit of a welding equipment capable of moving a pressure application shaft to a desired standby position when a motor is troubled.

1. (Amended) A driving unit of a welding equipment provided with a ~~pressure~~force application shaft that is driven by a motor, comprising:

a screw shaft ~~provided integrally with or substantially integrally~~coaxially fixed with a rotary shaft of the motor;

a nut ~~provided integrally with or substantially integrally~~fixed with the ~~pressure~~force application shaft and ~~is~~screwed~~d~~threadably engaged with a screw of the screw shaft; ~~and~~

a ~~baffling~~stabilizing mechanism ~~provided on~~engaging the ~~pressure~~force application shaft~~,~~ to prevent rotation thereof; and

~~wherein~~whereby ~~the rotary shaft of the motor is positioned substantially coaxially with the screw shaft and~~a rotary force ~~outputted~~output from the rotary shaft of the motor is converted into a reciprocating motion of the ~~pressure~~force application shaft which in turn applies a force to the welding equipment.

2. (Amended) The driving unit of a welding equipment according to Claim 1, wherein the screw shaft is integrally provided on the rotary shaft of the motor by extending the rotary shaft of the motor in the output direction of the motor to form the screw shaft on ~~the~~an extension portion.

4. (Amended) The driving unit of a welding equipment according to Claim 1, wherein the screw shaft is substantially integrally provided on the rotary shaft of the motor by rendering the rotary shaft of the motor hollow to form a hollow portion and ~~allowing and fixing~~having the screw shaft ~~to~~penetrate the hollow portion to fix the screw shaft to the hollow portion.

6. (Amended) The driving unit of a welding equipment according to Claim 1, wherein the nut is integrally provided on the ~~pressure~~force application shaft by rendering the ~~pressure~~force application shaft hollow, and forming a screw on the inner periphery of the ~~pressure~~force application shaft at the end thereof.

7. (Amended) The driving unit of a welding equipment according to Claim 1, wherein the nut is substantially integrally provided on the ~~pressure~~force application shaft by rendering the ~~pressure~~force application shaft hollow, and fixing a nut to the inner periphery of the ~~pressure~~force application shaft at the end thereof.

8. (Amended) The driving unit of a welding equipment according to Claim 1, wherein the nut is substantially integrally provided on the ~~pressure~~force application shaft by fixing the nut to the ~~pressure~~force application shaft at the end thereof.

9. (Amended) The driving unit of a welding equipment according to Claim 1, further comprising an elastic body disposed on the axis of the ~~pressure~~force application shaft through which the ~~pressure application~~force exerts, and an electromagnetic brake disposed on the rotary shaft of the motor.

10. (Amended) The driving unit of a welding equipment according to Claim 1, further comprising a machining part provided on the end of the rotary shaft opposite to the output side thereof, on which a ~~manually~~manual operating handle is mounted.

11. (Amended) The driving unit of a welding equipment according to Claim 1, further comprising a machining part provided on the end of the screw shaft opposite to the output side of the rotary shaft, on which a ~~manually~~manual operating handle is mounted.

12. (Amended) The driving unit of a welding equipment according to Claim 1, further comprising a driven part that is provided on the rotary shaft of the motor or the screw shaft and positioned between the rear of a body of the motor and the front of a position detector for transmitting the torque of the motor and a ~~manually~~manual operating driving part that is positioned eccentrically from the screw shaft for transmitting a turning torque to the driven part.